

Variability of the respiratory response of apples to low oxygen storage

Colgan, R.J., Rees, D., Thurston, K., Bishop, D. and Duff, A.

There is increasing interest in storage of apples at low oxygen concentrations in order to extend the storage period and reduce the incidence of physiological disorders. Technologies for assessing and responding to fruit stress responses to low oxygen are being investigated as part of a strategy for Dynamic Controlled Atmosphere storage. Measurement of respiratory characteristics is one technology being investigated.

The 'LabPod' (SCS Ltd), chamber was used for measurement of respiratory characteristics to determine the response of Gala and Braeburn fruit to a range of oxygen concentrations below 1 kPa. With a holding capacity of 75 Kg and independent control of atmospheric composition the LabPod is capable of assessing changes in the respiration characteristics from a representative orchard consignment. Gala and Braeburn apples from three orchards with histories of differing storage potential were stored for 8 and 7 months, respectively. A Gala storage regime of 3kPa CO₂, <1kPa O₂ at 0.5-1.0°C, was established immediately with nitrogen flushing while Braeburn conditions of 0.4 kPa CO₂, < 1 kPa O₂ 1.5-2.0°C were established over a 21 day period.

Fruit quality and incidence of physiological disorders were assessed periodically during storage. Respiratory characteristics; rate of carbon dioxide evolution, oxygen consumption and respiratory quotient, were assessed at intervals throughout the storage period. The rate of O₂ consumption and CO₂ production for Braeburn apples decreased more markedly at low oxygen, indicating a switch to anaerobic than for Gala. The respiratory quotient (RQ) increases markedly below 0.4 kPa for Braeburn, but for Gala this response is not seen until oxygen <0.2 kPa. Differences in the magnitude of the RQ response between consignments of fruit from different orchards was observed which appear to be consistent between seasons.

Initial data relating these characteristics to fruit quality following long-term storage at low oxygen are presented which are consistent our understanding that fruit exhibiting a lower RQ response is less prone to low oxygen disorders. Orchard differences are discussed in relation to apple texture and porosity.